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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample and a personnel evaluation form are also included. (AG)

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June 1971

U.S. Training and
Employment Service
Technical Report
S-342R

Development of USTES

APTITUDE TEST
BATTERY FOR

SEWAGE-PLANT OPERATOR
(any ind.)
954.782

WATER-TREATMENT PLANT OPERATOR
(waterworks)
954.782

SEWAGE-PLANT OPERATOR
(sanitary ser.)
955.782

U.S. DEPARTMENT OF LABOR
Manpower Administration

Technical Report on Development of USTES Aptitude Test Battery
For . . . .

Sewage-Plant Operator (any ind.) 954.782
Water-Treatment-Plant Operator (waterworks) 954.782
Sewage-Plant Operator (sanitary ser.) 955.782
Waste-Treatment-Plant Operator (sanitary ser.) I 955.782

(Developed in Cooperation with the Ohio and
Pennsylvania State Employment Services)

S-342R

U. S. Department of Labor
Manpower Administration

June 1971

FOREWORD

The United States Training and Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination, predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

Study Nos. 2830 & 2551

DEVELOPMENT OF USTES APTITUDE TEST BATTERY

for

Sewage-Plant Operator (sanitary ser.) 955.782-018

S-342R

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Sewage-Plant Operator (sanitary ser.) 955.782. The plant title of this job is Waste-Treatment-Plant Operator (sanitary ser.) I. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
G - General Learning Ability	90
N - Numerical Aptitude	85
Q - Clerical Perception	80

RESEARCH SUMMARY

Sample:

Fifty-seven male trainees enrolled in a 44-week training program under MDTA-OJT in Pennsylvania. Thirty individuals were Negroes and the remaining 27 subjects were nonminority group members.

Criterion:

Instructors' ratings.

Design:

Longitudinal (test data were collected prior to the beginning of the training and criterion data were collected at the end of the 44-week course).

Minimum aptitude requirements (or norms) were determined on the basis of a job analysis, and statistical analyses of aptitude mean scores, standard deviations, aptitude-criterion correlations, and selective efficiencies. Although norms were developed through analyses of data from total sample, effect of possible norms resulting from analyses on both minorities and nonminorities was investigated before final norms were set.

Predictive Validity:

Phi coefficient for total sample = .45 (P/2 is less than .0005)
Phi coefficient for minority subsample = .33 (P/2 is less than .05)
Phi coefficient for nonminority subsample = .36 (P/2 is less than .05)
There is essentially no difference in these phi coefficients.

Effectiveness of Norms:

Only 72% of the nontest-selected trainees used for this study were good trainees; if the trainees had been test-selected with the above norms, 89% would have been good trainees. Twenty-eight percent of the nontest-selected trainees used for this study were poor trainees; if the trainees had been test-selected with the above norms, only 11% would have been poor trainees. The effectiveness of the norms is shown graphically in Table 1

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Trainees	72%	89%
Poor Trainees	28%	11%

Comparison of Minority and Nonminority Groups:

No differential validity for this battery was found. (See phi coefficients above.)

Seventeen percent of the minority workers did not meet the established norms and were good workers; 15% of the nonminority workers did not meet the established norms and were good workers. The difference is not significant.

SAMPLE DESCRIPTION

Size:

N = 57

Occupational Status:

MDTA-OJT trainees.

Work Setting:

Trainees were enrolled in a 44-week training program under the Manpower Development and Training Act sponsored by the Federal Water Pollution Control Administration.

Selection Requirements:

Education: Completion of tenth grade preferred.

Previous Experience: None required.

Tests: None used.

Other: Ability to read, write and do fundamental arithmetic.

Principal Activities:

The job duties for this occupation are those shown in the job description in the Appendix.

Minimum Experience:

Trainees were tested prior to the beginning of the MDTA training program. None had any previous experience.

TABLE 2

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education and Cultural Exposure

	Mean	SD	Range	r
Age (years)	39.2	9.1	20-58	-.160
Education (years)	11.6	1.4	7-16	.161
Cultural Exposure	2.3	1.3	0-5	.352**

**Significant at the .01 level

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002B and the Research Questionnaire-Background were administered to the sample during the period from August 1969 to October 1969.

CRITERION

The criterion data consisted of instructors' ratings of job proficiency made at the end of the training program. A second criterion measure, instructor's ratings of classroom performance, was obtained but not used since statistical analysis showed that no additional significant aptitude-criterion correlations were obtained.

Rating Scale:

USTES Form SP-21 "Descriptive Rating Scale" was used. The scale (see Appendix) consists of seven items with five alternatives for each item. The alternatives indicate the different degrees of job proficiency.

Reliability:

Since only one rating of job proficiency was obtained, no external criterion reliability was established. However, internal consistency was established by correlating Item G with the total score of all other items on the rating scale. This comparison resulted in a correlation of .79.

Criterion Score Distribution:

	Total Sample N = 57	Minority Subsample N=30	Nonminority Subsample N=27
Possible Range:	7-35	7-35	7-35
Actual Range:	19-35	19-35	21-35
Mean:	27.0	25.2	29.1
Standard Deviation:	5.0	4.6	4.7

Criterion Dichotomy:

The criterion distribution was dichotomized by the test development analyst into high and low groups by placing 28% of the sample in the low criterion group to correspond with the percentage of trainees considered marginal or unsatisfactory. Trainees in the high criterion group were designated as "good trainees" and those in the low criterion group as "poor trainees." The critical criterion score is 24.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Aptitudes G, V and Q were considered for inclusion in the norms because the qualitative analysis indicated that they were important for the job duties. Aptitudes G and Q were also included because these aptitudes had relatively high mean scores, and Aptitudes V and Q were also included because these aptitudes had relatively low standard deviations. Tables 3, 4 and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis
(Based on the job analysis, the aptitudes indicated appear to be important to the work performed)

Aptitude	Rationale
G - General Learning Ability	Indicated by course content and the necessity of learning the underlying principles of wastewater treatment work.
V - Verbal Aptitude	Must follow detailed written instructions on the job.
N - Numerical Aptitude	Must be able to use the slide rule in making arithmetic computations.
Q - Clerical Perception	Ability needed to read and record meter and gauge readings accurately
M - Manual Dexterity	Required to operate assigned wastewater treatment equipment.

TABLE 4

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criteria of Instructor's Ratings of Job Proficiency (r_1) and Instructor's Ratings of Classroom Performance (r_2) for the Aptitudes of the GATB, N = 57

Aptitude	Mean	SD	Range	r_1	r_2
G - General Learning Ability	97.6	15.5	63-127	.232	.221
V - Verbal Aptitude	96.5	12.9	66-127	.054	.117
N - Numerical Aptitude	98.9	17.3	59-129	.334*	.276*
S - Spatial Aptitude	98.6	18.6	65-147	.189	.115
P - Form Perception	91.0	17.1	58-131	.198	.153
Q - Clerical Perception	99.7	14.0	69-133	.172	.092
K - Motor Coordination	91.6	17.7	37-122	-.023	.249
F - Finger Dexterity	83.2	20.1	41-129	.286*	.215
M - Manual Dexterity	88.3	19.4	52-139	.183	.216

*Significant at the .05 level

TABLE 4A

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criteria of Instructor's Ratings of Job Proficiency (r_1) and Instructor's Ratings of Classroom Performance (r_2) for the Minority Subsample, N=30

Aptitude	Mean	SD	Range	r_1	r_2
G - General Learning Ability	92.9	15.3	63-127	.237	.200
V - Verbal Aptitude	94.7	12.6	73-125	.022	.064
N - Numerical Aptitude	92.7	16.6	59-127	.112	.048
S - Spatial Aptitude	93.6	14.9	65-137	.452*	.256
P - Form Perception	83.9	16.3	58-125	.091	.080
Q - Clerical Perception	93.3	12.2	69-124	-.041	-.108
K - Motor Coordination	93.2	17.1	37-122	-.044	.205
F - Finger Dexterity	76.9	20.0	41-129	-.164	-.027
M - Manual Dexterity	83.6	17.6	55-120	-.115	-.006

*Significant at the .05 level

TABLE 4B

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criteria of Instructor's Ratings of Job Proficiency (r_1) and Instructor's Ratings of Classroom Performance (r_2) for the Nonminority Subsample, N=27

Aptitude	Mean	SD	Range	r_1	r_2
G - General Learning Ability	102.8	13.9	69-122	-.015	.169
V - Verbal Aptitude	98.6	12.8	66-127	-.033	.138
N - Numerical Aptitude	105.7	15.4	63-129	.349	.489**
S - Spatial Aptitude	104.2	20.6	78-147	-.196	-.070
P - Form Perception	98.9	14.1	70-131	-.042	.130
Q - Clerical Perception	106.8	12.4	79-133	.003	.182
K - Motor Coordination	89.9	18.3	62-130	.073	.332
F - Finger Dexterity	90.1	17.7	50-129	.606**	.454*
M - Manual Dexterity	93.5	20.0	52-139	.295	.391*

**Significant at the .01 level
*Significant at the .05 level

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data: Important	X	X	X			X			X
Irrelevant									
Relatively High Mean	X		X	X		X			
Relatively Low Standard Dev.		X				X			
Significant Correlation with Criterion			X					X	
Aptitudes to be Considered for Trial Norms	G	V	N			Q		F	

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degree to which trial norms consisting of various combinations of Aptitudes G, V, N, Q and F at trial cutting scores were able to differentiate between the 72% of the sample considered good trainees and 28% of the sample considered poor trainees. Trial cutting scores at five-point intervals approximately one standard deviation below the mean are tried because this will eliminate

about one-third of the sample with three-aptitude norms. For two-aptitude norms, minimum cutting scores of slightly higher than one standard deviation below the mean will eliminate about one-third of the sample; for four-aptitude trial norms, cutting scores of slightly lower than one standard deviation below the mean will eliminate about one-third of the sample. The phi coefficient was used as a basis for comparing trial norms. Norms of G-90, N-85 and Q-80 provided the optimum differentiation for the occupation of Sewage-Plant Operator (sanitary ser.) 955.782. The validity of these norms is shown in Table 6 and is indicated by a phi coefficient of .45 (statistically significant at the .0005 level).

TABLE 6

Predictive Validity of Test Norms, G-90, N-85 and Q-80

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Trainees	9	32	41
Poor Trainees	12	4	16
Total	21	36	57

Phi coefficient (ϕ) = .45 Chi square (X^2_y) = 11.7
Significance level = $P/2 < .0005$

TABLE 7

Concurrent Validity of Test Norms of G-90, N-85 and Q-80
When Applied to Minority Subsample

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Trainees	5	11	16
Poor Trainees	10	4	14
Total	15	15	30

Phi coefficient (ϕ) = .33 Chi square (X^2_y) = 3.3
Significance level = $P/2 < .05$

TABLE 8

Concurrent Validity of Test Norms of G-90, N-85 and Q-80
When Applies to Nonminority Subsample

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Trainees	4	21	25
Poor Trainees	2	0	2
Total	6	21	27

Phi coefficient (ϕ) = .36 Chi square (X^2_y) = 3.5
Significance level = $P/2 < .05$

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for his study met the requirements for incorporating the occupation studied into OAP-23 which is shown in the 1970 edition of Section II of the Manual for the General Aptitude Test Battery. A phi coefficient of .37 is obtained with the OAP-23 norms of G-80, N-80 and Q-80.

CHECK STUDY RESEARCH SUMMARY SHEET

S-342R GATB Study #2551

Water-Treatment-Plant Operator (waterworks) 954.782-026
Sewage-Plant Operator (any ind.) 954.782-018

CHECK STUDY #1 RESEARCH SUMMARY

Sample:

Sixty-one male workers employed as Water-Treatment-Plant Operators and Sewage-Plant Operators at various plants in Ohio. This study was conducted prior to the requirement of providing minority group status. Therefore, minority group composition is unknown.

TABLE 9

Means, Standard Deviations (SD), Ranges and Bi-Serial Correlations with the Criterion (r) for Age, Education, Experience and Aptitudes of the GATB, N = 61

	Mean	SD	Range	r
Age (years)	41.2	10.5	24-63	.235
Education (years)	11.6	2.0	7-16	.176
Experience (months)	101.1	76.0	13-361	-.100
G - General Learning Ability	109.2	13.5	75-140	.451**
V - Verbal Aptitude	101.8	13.0	78-131	.401**
N - Numerical Aptitude	109.7	14.9	72-139	.285*
S - Spatial Aptitude	104.4	18.3	61-150	.241
P - Form Perception	94.7	17.3	47-138	.078
Q - Clerical Perception	98.4	15.1	69-139	.221
K - Motor Coordination	96.6	14.9	58-122	-.206
F - Finger Dexterity	93.3	20.2	37-131	-.083
M - Manual Dexterity	90.0	20.5	29-136	-.264*

**Significant at the .01 level
*Significant at the .05 level

Criterion:

State Board License Examination grades collected in 1964.

Design:

Concurrent (test and criterion data were collected at approximately the same time).

Concurrent Validity:

Phi coefficient = .19

Effectiveness of Norms:

Only 39% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the S-342R norms, 44% would have been good workers. Sixty-one percent of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-342R norms, only 56% would have been poor workers. The effectiveness of the norms when applied to this independent sample is shown graphically in Table 10.

TABLE 10

Effectiveness of S-342R Norms on Check Study Sample #1

	Without Tests	With Tests
Good Workers	39%	44%
Poor Workers	61%	56%

TABLE 11

Concurrent Validity of S-342R Norms of G-90, N-85, Q-80 on Check Study Sample #1

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	1	23	24
Poor Workers	8	29	37
Total	9	52	61

Phi coefficient (ϕ) = .19 Chi square (X^2_y) = 2.3
Significance level = P/2 $<$ .10

APPENDIX

Course Outline

		Hours
I.	Orientation - Water Supply Wastewater Control	4
II.	Orientation - Wastewater Treatment Plant	4
III.	Arithmetic Development	24
IV.	Communication Development	32
V.	Science Development Chemistry Physics Biology	34
VI.	Measurement and Drafting Development	20
VII.	Fundamentals for Plant Operators	30
VIII.	Treatment Plant Equipment and Plant Electricity	20
IX.	Treatment Plant	20
X.	Treatment Plant Unit Operations	20
XI.	Laboratory	20
XII.	Plant Maintenance	10
XIII.	Materials and Supplies	10
XIV.	Plant Records and Reports	6
XV.	Instrumentation	10
XVI.	Plant Safety	4
XVII.	Treatment Plant Design	10
XVIII.	Treatment Plant Operation	40
XIX.	On-the-Job Training and Remedial Training	72
XX.	Review and Career Development	40
	Total	430

(Also, approximately 1430 hours of applied OJT)

SP-21
REV 9-67

UNITED STATES EMPLOYMENT SERVICE
DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

SCORE ___ _____

RATING SCALE FOR _____
D.O.T. TITLE AND CODE

Directions: Please read the "Suggestions to Raters" and then fill in the items listed below. In making your ratings, only one box should be checked for each question.

SUGGESTIONS TO RATERS

We are asking you to rate the job performance of the people who work for you. These ratings will serve as a "yardstick" against which we can compare the test scores in this study. The ratings must give a true picture of each worker or this study will have very little value. You should try to give the most accurate ratings possible for each worker.

These ratings are strictly CONFIDENTIAL and won't affect your workers in any way. Neither the ratings nor test scores of any workers will be shown to anybody in your company. We are interested only in "testing the tests." Ratings are needed only for those workers who are in the test study.

Workers who have not completed their training period, or who have not been on the job or under your supervision long enough for you to know how well they can perform this work should not be rated. Please inform the test technician about this if you are asked to rate any such workers.

In making ratings, don't let general impressions or some outstanding trait affect your judgment. Try to forget your personal feelings about the worker. Rate him only on the way he does his work. Here are some more points which might help you:

1. Please read all directions and the rating scale THOROUGHLY before rating.

2. For each question compare your workers with "workers-in-general" in this job. That is, compare your workers with other workers on this job that you have known. This is very important in small plants where there are only a few workers. We want the ratings to be based on the same standard in all the plants.

3. A suggested method is to rate all workers on one question at a time. The questions ask about different abilities of the workers. A worker may be good in one ability and poor in another; for example, a very slow worker may be accurate. So rate all workers on the first question, then rate all workers on the second question, and so on.

4. Practice and experience usually improve a worker's skill. However, one worker with six months' experience may be a faster worker than another with six years' experience. Don't rate one worker as poorer than another because he has not been on the job as long.

5. Rate the workers according to the work they have done over a period of several weeks or months. Don't rate just on the basis of one "good" day, or one "bad" day or some single incident. Think in terms of each worker's usual or typical performance.

6. Rate only the abilities listed on the rating sheet. Do not let factors such as cooperativeness, ability to get along with others, promptness and honesty influence your ratings. Although these aspects of a worker are important, they are of no value for this study as a "yardstick" against which to compare aptitude test scores.

Name of worker (PRINT) _____
(LAST) (FIRST)

Sex: Male _____ Female _____

Company Job Title: _____

How often do you see this worker in a work situation?

- ☐ See him at work all the time.
- ☐ See him at work several times a day.
- ☐ See him at work several times a week.
- ☐ Seldom see him in work situation.

How long have you worked with him?

- ☐ Under one month.
- ☐ One to two months.
- ☐ Three to five months.
- ☐ Six months or more.

A. How much work can he get done? (Worker's ability to make efficient use of his time and to work at high speed.)

1. ☐ Capable of very low work output. Can perform only at an unsatisfactory pace.
2. ☐ Capable of low work output. Can perform at a slow pace.
3. ☐ Capable of fair work output. Can perform at an acceptable but not fast pace.
4. ☐ Capable of high work output. Can perform at a fast pace.
5. ☐ Capable of very high work output. Can perform at an unusually fast pace.

B. How good is the quality of his work? (Worker's ability to do high-grade work which meets quality standards.)

1. ☐ Performance is inferior and almost never meets minimum quality standards.
2. ☐ The grade of his work could stand improvement. Performance is usually acceptable but somewhat inferior in quality.
3. ☐ Performance is acceptable but usually not superior in quality.
4. ☐ Performance is usually superior in quality.
5. ☐ Performance is almost always of the highest quality.

C. How accurate is he in his work? (Worker's ability to avoid making mistakes.)

1. ☐ Makes very many mistakes. Work needs constant checking.
2. ☐ Makes frequent mistakes. Work needs more checking than is desirable.
3. ☐ Makes mistakes occasionally. Work needs only normal checking.
4. ☐ Makes few mistakes. Work seldom needs checking.
5. ☐ Rarely makes a mistake. Work almost never needs checking.

D. How much does he know about his job? (Worker's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with his work.)

1. ☐ Has very limited knowledge. Does not know enough to do his job adequately.
2. ☐ Has little knowledge. Knows enough to "get by."
3. ☐ Has moderate amount of knowledge. Knows enough to do fair work.
4. ☐ Has broad knowledge. Knows enough to do good work.
5. ☐ Has complete knowledge. Knows his job thoroughly.

E. How much aptitude or facility does he have for this kind of work? (Worker's adeptness or knack for performing his job easily and well.)

1. ☐ Has great difficulty doing his job. Not at all suited to this kind of work.
2. ☐ Usually has some difficulty doing his job. Not too well suited to this kind of work.
3. ☐ Does his job without too much difficulty. Fairly well suited to this kind of work.
4. ☐ Usually does his job without difficulty. Well suited to this kind of work.
5. ☐ Does his job with great ease. Exceptionally well suited for this kind of work.

F. How large a variety of job duties can he perform efficiently? (Worker's ability to handle several different operations in his work.)

1. ☐ Cannot perform different operations adequately.
2. ☐ Can perform a limited number of different operations efficiently.
3. ☐ Can perform several different operations with reasonable efficiency.
4. ☐ Can perform many different operations efficiently.
5. ☐ Can perform an unusually large variety of different operations efficiently.

G. Considering all the factors already rated, and only these factors, how acceptable is his work? (Worker's "all-around ability" to do his job.)

1. ☐ Would be better off without him. Performance usually not acceptable.
2. ☐ Of limited value to the organization. Performance somewhat inferior.
3. ☐ A fairly proficient worker. Performance generally acceptable.
4. ☐ A valuable worker. Performance is usually superior.
5. ☐ An unusually competent worker. Performance almost always top notch.

Rated by _____ Title _____ Date _____

Company or organization _____ Location _____ (CITY) (STATE)

FACT SHEET

Job Title: Sewage-Plant Operator (sanitary ser.) 955.782-018

Job Summary: Operates raw waste water treatment equipment such as raw waste water pumps, ejectors, electric motors, heating boilers, sludge pumps, waste gas burners and digesters.

Work Performed: Starts and stops and regulates automatic controls according to established plant procedures and practices during each specific phase of the waste water treatment. Observes gauges and meters on the station panel board and makes hourly records of amperage and flow readings. Charts the depth of sewage intake for the complete logging on informational format sheets for subsequent computer programming. Takes periodic samples of waste water in glass containers from indicated specific points during each operational shift for laboratory analysis. Prepares and submits reports of daily shift operations. Performs related tasks in maintenance and housekeeping such as minor repairs and simple replacements using hand tools.

Job Title: Water-Treatment-Plant Operator (waterworks) 954.782-026
Sewage-Plant Operator (any ind.) 954.782-018

Job Summary: Responsible for the operation and maintenance of a waste water treatment and/or water supply works. Tests samples of incoming and processed water to determine kinds and amounts of chemicals and suspended solids in water. Interprets results and alters processing operation to provide a safe, potable water to users or to prevent pollution of receiving waters.

Work Performed: Water-Treatment-Plant Operator records meter readings and takes samples of raw, primary settled and final effluent waste water to determine volume and characteristics. Performs routine laboratory tests such as biochemical oxygen demand, suspended solids, dissolved oxygen and pH, following normal laboratory procedures. Interprets flow measurements and test results to make necessary changes in operation of system. Maintains records prescribed by regulatory agency. Responsible for the efficient operation of any of the following processes: aeration tank systems such as activated sludge, extended aeration or contact stabilization processes; trickling filters, heated and unheated digestors; chemical precipitation; vacuum filtration, etc. May set valves or gates to regulate flow patterns; stop, start, or regulate blower motors, sludge pumps, and recirculating pumps. Regulates and controls temperature and other conditions of digestors; measures chemicals, fills and operates chemical feeders; scrapes and removes grit. Makes necessary adjustments and repairs on meters, pumps, piping, chemical feeders, valves, etc., in system using normal bench and hand tools. May discuss unusual waste water problems with industrial contributors and recommend processes or procedures to avoid problems.

Water-Treatment-Plant Operator in Charge records meter readings and takes sample of raw, processed and finished water. Performs tests following normal laboratory procedures for chemical constituents as required by the treatment processes and bacteriological examinations to determine that water is safe

for human consumption. Maintains records of volumes, test results, etc., and interprets such records to make necessary changes in processing. Responsible for the efficient operation of any of the following pieces of equipment and/or processes: chemical feeding and mixing mechanisms; deep well, low and high service pumps; aerators; filters; tanks; zeolite softeners; control panels; settling basins; flow controllers; flocculators and sludge pumps. Tests and records required by the regulatory agency vary depending upon type of system operated; i.e., bacteriological control, zeolite process, purification, lime-soda softening. Responsible for the repair and maintenance of plant equipment such as pumps, water lines, filters, chlorination equipment, automatic feeding machines, controllers, meters, etc., using specialized mechanical equipment and ordinary bench and hand tools.

Effectiveness of Norms:

Only 72% of the nontest-selected trainees used for this study were good trainees; if the trainees had been test-selected with the S-342R norms, 89% would have been good trainees. Twenty-eight percent of the nontest-selected trainees used for this study were poor trainees; if the trainees had been test-selected with the S-342R norms, only 11% would have been poor trainees. (Validation sample.)

Effectiveness of Norms:

Only 39% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the S-342R norms, 44% would have been good workers. Sixty-one percent of the nontest-selected workers used for this study were poor workers; if the nontest-selected workers had been test-selected with the S-342R norms, only 56% would have been poor workers. (Cross-Validation Sample)

Applicability of S-342R Norms:

The aptitude test battery is applicable to jobs which include a majority of the duties described above.

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